

Investigating Ecotourism as a Sustainable Strategy for Supporting Sunda Pangolin Conservation in Malaysia



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ABSTRACT

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The Sunda pangolin (*Manis javanica*) is listed as critically endangered due to severe population declines resulting from poaching, habitat loss, and illegal wildlife trade. Ecotourism has been increasingly promoted as a conservation tool that can raise public awareness, secure funding for conservation, and encourage community involvement in wildlife protection. This study investigates the role of ecotourism in supporting pangolin conservation at the Sustainable Forest Ecology Research Area (SFERA), Universiti Malaysia Sabah (UMS), by examining the relationship of visitor awareness, visitor willingness, and visitor preferences on support for pangolin conservation. A quantitative survey was carried out on 377 respondents, and the data were analyzed using descriptive statistics, correlation analysis and multiple regression techniques. The regression model explained 72.1% of the variance in support for pangolin conservation ($R^2 = 0.721$). Visitor awareness emerged as the strongest predictor ($\beta = 0.529$, $p < 0.001$), followed by visitor willingness ($\beta = 0.315$, $p < 0.001$), while visitor preferences did not show a significant predictor ($\beta = 0.059$, $p = 0.176$). These findings suggest that ecotourism primarily supports pangolin conservation by strengthening awareness and willingness, rather than shaping activity preferences alone. The study highlights the importance of conservation-oriented education and interpretation in university-based ecotourism settings.

1. INTRODUCTION

The Sunda pangolin (*Manis javanica*) is one of the most critically endangered mammal species worldwide, declining at an alarming rate due to habitat conversion, illegal wildlife trade in its body parts, and demand for its scales and meat in the commercial market [1]. There is an urgent need to intensify conservation actions to halt the loss and extinction of the Sunda pangolin in Malaysia, which is part of its range countries. The insensible delay in conservation gains can be attributed to challenges in law enforcement and public recognition, despite its protection under the primary national wildlife regulation and restrictions on international trade [2]. Recently, ecotourism has been considered a possible way to boost wildlife conservation through environmental education, community participation, and financial contributions from nature-based tourism [3]. Ecotourism may contribute to improved conservation outcomes by enhancing visitors' awareness, positive attitudes towards conservation, support for

pangolin conservation, and funding for on-the-ground activities [4]. Nevertheless, there is limited empirical research concerning ecotourism and pangolin conservation, especially in Malaysia.

The Sustainable Forest Ecology Research Area (SFERA) at Universiti Malaysia Sabah (UMS) is dedicated to protected forest education, ecotourism, outreach, and environmental learning. SFERA provides a glimpse into forest ecosystems, conservation biology, and species protection work that influence awareness, support, and preferences for engaging in ecotourism activities for species conservation, especially regarding the Sunda pangolin. The research likely fills the gap by providing quantifiable evidence of ecotourism's role in pangolin conservation. The study examines how ecotourism at SFERA influences visitation awareness, attitudes, and the will to conserve the Sunda pangolin. This study will enable the development of stronger education-based ecotourism programs and highlight conservation interventions that complement national and global biodiversity priorities,

translating them into commitments such as the Sustainable Development Goals (SDG 14 and SDG 15). This study seeks to evaluate the elements of visitor awareness, willingness, and preferences regarding ecotourism and to establish their relationships with support for pangolin conservation. The study offers insights for conservation practitioners that ecotourism managers and policymakers need to develop evidence-based ways to increase wildlife protection.

SFERA provides an appropriate setting for examining this issue, as its ecotourism setting combines recreational participation with environmental interpretation and biodiversity-related learning. It enables the study to assess whether ecotourism-based exposure to conservation values is associated with support for a threatened species such as the Sunda pangolin.

2. LITERATURE REVIEW

2.1 Pangolin conservation status and challenges

Ecotourism is responsible travel to natural areas that conserves the environment, sustains the well-being of local people, and provides educational experiences [3]. The contribution of ecotourism to conservation is realized through various means when practiced properly: (i) earning revenue for the protected areas, (ii) enhancing visitor understanding via interpretation, (iii) changing conservation attitudes and behavior, and (iv) promoting guardianship behavior for visitors and the community. Previous studies have shown that ecotourism-based education plays a significant role in enhancing wildlife conservation intentions, especially when visitors participate in guided interpretation or species-specific activities [5, 6].

Ecotourism is now widely recognised as an important mechanism for building awareness to support biodiversity conservation through education, community engagement, and sustainable tourism [7]. In addition to this, it offers an avenue for creating awareness, developing a pro-conservation mindset and for mobilizing financial resources for conservation management. Conservation outcomes will be improved through visitation within the ecotourism context as visitors become engaged in interpretation and behavior support for critically endangered species like the Sunda pangolin (*Manis javanica*) [8]. This section discusses the available literature on pangolin conservation, ecotourism, visitor awareness, willingness to conserve, and preference for ecotourism activities.

Sunda pangolins are nocturnal and solitary mammals found in Southeast Asia (including Malaysia) and are classified as Critically Endangered by the International Union for Conservation of Nature (IUCN) due to significant population declines from poaching and illegal wildlife trade [9]. Pangolins are the most trafficked mammals, with a traffic in pangolins having been traced to Malaysia. Poaching and rapid land-use change are threats that lead to the loss of natural habitats. Awareness of pangolin ecology, behavioral characteristics, and conservation status is low even among locals. The lack of this information acts as an obstacle to realizing conservation goals and makes education and outreach interventions worthwhile engagement interventions.

Studies over the last five years reveal increasing recognition of ecotourism in support of pangolin conservation. For example, Choo et al. [10] noted the need to enhance education

within the Malaysian community due to inadequate knowledge of pangolin conservation. Aprile and Punzo [5] stated that guided interpretation can shape impressions of ecotourism in protected areas and increase conservation intentions during visits. In relation to tourism, Yu et al. [11] found that knowledge of the environment and emotional attachment are significant determinants of tourists' intentions to support wildlife conservation. Situmorang and Hussain [12] found that experiential ecotourism in Indonesia has a positive impact on pangolin conservation. In wildlife sanctuaries, Bhat [6] highlighted that interpretive content could enhance conservation engagement.

Charlie et al. [13] examined that Malaysian youth's readiness to conserve species was affected by the utility of biodiversity education. For pangolins, Choo et al. [10] discovered that many Malaysians are not aware of pangolins, and education-based ecotourism is necessary. Peng et al. [14] discovered that university-based ecotourism optimizes conservation literacy through the combination of guided learning and nature-based exposure. Thus, recent research provides support for three major conclusions: education is a precursor of conservation intention; ecotourism is an effective means of delivering environmental education; and ecotourism that focuses on specific species can improve the public's attitude toward conservation.

Given the conservation challenges facing the Sunda pangolin, it is necessary to consider practical mechanisms to strengthen public awareness and support for species protection.

2.2 Ecotourism as a conservation mechanism

The university-school-based ecotourism sites (i.e., SFERA UMS) serve as a proper model because they integrate recreational research, conservation outreach, and environmental education within the same provision. That means that individual visits to this site can be exposed to scientific understanding and conservation messages, which could increase visitors' knowledge of threatened species like the Sunda pangolin.

The understanding of visitors is defined as awareness of the animals, understanding of the species, its conservation status, and its ecological roles. Awareness is an important aspect for changing ecotourists' attitudes in supporting conservation [15]. Empirical studies have shown that visitors with greater knowledge of endangered species research are more likely to support it [13]. For pangolins, knowledge is important because many people lack information about their behavior, ecology, and threats [10]. Studies show that ecotourism experiences involving education can increase awareness and support for pangolin conservation in the long run. Besides that, visitor willingness encompasses behavioral intentions to donate, participate in anti-conservation campaigns, report wildlife crime, or engage in conservation action [16]. Willingness is influenced by awareness, attitude, moral obligation, and emotional bond to wildlife [11]. In the context of wildlife ecotourism, exposure to conservation messages can enhance visitors' willingness to engage in support for pangolin conservation; thus, this willingness can serve as an important indicator of ecotourism effectiveness [12]. Enhancing people's willingness to conserve is critical for pangolin preservation, given the long-term challenges of illegal trade.

Visitor preferences were discussed in this study as the extent to which they prefer conservation-based ecotourism experiences, particularly those involving interpretation,

guided learning, and educational activities related to wildlife and forest conservation. These include activities such as guided walks in the forest, wildlife interpretations, educational workshops, or hands-on conservation exhibits. It is relevant in tourism management to establish visitor preferences to create meaningful conservation-based activities through ecotourism. Exploratory learning, which involves exploration, interpretation, and hands-on conservation activities, fosters emotional connection and forms a long-term interest in biodiversity conservation, as stated in past research [14]. However, given the delicate nature of pangolin conservation (*Aspergillus*), a direct encounter is ethically unacceptable. Consequently, interpretive ecotourism, exhibitions, and educational modules are essential for shaping people's preferences.

Although ecotourism can offer a platform for learning about conservation, visitors often do not have the same perspective. People may show interest in supporting conservation based on specific individual characteristics.

2.3 Visitor-related factors influencing conservation support and theoretical framework: Theory of Planned Behaviour

The present study draws upon the Theory of Planned Behavior (TPB), which incorporates individual beliefs and behavior intentions to support a specific action or outcome. TPB posits that support for an action or intention is a product of cognitive evaluation, motivational readiness, and a personal orientation toward a specific type of action. With respect to wildlife conservation and ecotourism, this framework helps to clarify why visitors who are more aware of specific conservation issues and more willing to perform conservation-related actions and have a positive attitude toward ecotourism-related experiences may support pangolin conservation. Specifically, in this study, visitor awareness refers to cognition, visitor willingness is motivational orientation, and visitor preferences are personal orientation toward ecotourism-related experience. These factors can together provide a theory-based explanation of the support for pangolin conservation from a university-based ecotourism perspective.

Based on this theoretical framework, visitor awareness, willingness and preferences are theorized to parallel predictors of support for pangolin conservation. This study does not assume there are mediating or hierarchical links among the predictors; rather, each predictor was analyzed independently for its effect on conservation support. This approach aligns with the study's aim of revealing the relative predictive effects of these visitor-related factors, which are crucial components of the TPB, on conservation action responses.

In this paper, visitor preference refers to a personal orientation to conservation-supporting ecotourism experiences. Visitors with a preference for activities that involve interpretation, guided exploration, and diversity offers may be more responsive to conservation messages and thus more likely to support pangolin conservation, but the effect may be less than those of awareness or willingness in that a preference for an activity does not necessarily mean a commitment to conservation. Guided by the TPB, the study proposes that visitors' cognitive understanding, motivational readiness, and personal orientation to ecotourism experiences are important determinants of support for pangolin conservation.

This leads to the following hypotheses:

H1: Visitors' awareness has a positive effect on support for

pangolin conservation;

H2: Visitors' willingness has a positive effect on support for pangolin conservation; and

H3: Visitor preference has a positive effect on support for pangolin conservation.

In addition to support for pangolin conservation, the proposed research model builds on the TPB and related ecotourism-conservation literature by suggesting that awareness, willingness, and preference are important antecedents of support for pangolin conservation (see Figure 1).

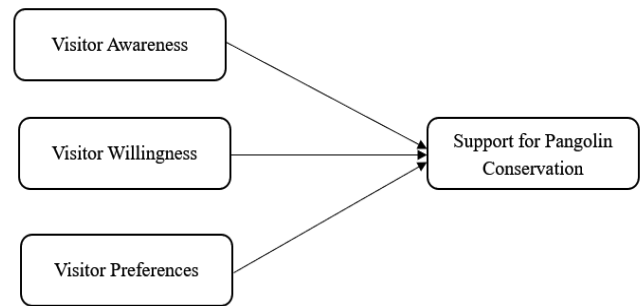


Figure 1. Research model

3. METHODOLOGY

3.1 Research design

This research used a quantitative research design to explore the role of ecotourism as a contributor to the conservation of the Sunda pangolin by analyzing visitor awareness, willingness, and preferences regarding ecotourism activities. A structured questionnaire survey method was used to gather primary data from visitors of the SFERA of UMS. This quantitative approach allows for the systematic measurement of the behavioral constructs and the use of inferential statistical analysis to determine the relationships among variables.

3.2 Study area

The study was conducted at the SFERA, which represents a forests-centered ecotourism and environmental education research area that is located in UMS. The SFERA site is made up of hill dipterocarp forest, a visitor-interpreted area, forest trails, biodiversity learning stations, and environmental education facilities. As an ecotourism research area managed by a university, the SFERA has been designed for recreational purposes and biodiversity interpretations and environmental learning purposes which makes it relevant to investigate in terms of if visitors experiences in ecotourism can still be related to their awareness, willingness, preferences and support to pangolin conservation. Apart from recreational, SFERA also offers educational exposure through the guided activities, biodiversity interpretation and site-based conservation messaging. Visitors are made aware of forest biodiversity, wildlife values, and species conservation as they are engaged interpretively at selected points across the site. Within this context, pangolin conservation was positioned as part of a wildlife-related conservation theme that is communicated to visitors, thus providing an impetus to assess respondents' support towards pangolin conservation.

3.3 Sampling procedure

This study utilized the Krejcie and Morgan sampling table to calculate a sample of 377 respondents, after applying the standard parameters for sample size determination based on population estimates. Convenience sampling, a widely used approach for recruiting participants in ecotourism and visitor studies through accessibility and willingness, was utilized. The sample comprised UMS students and staff and local and international tourists who visited SFERA. Thus, the sample represented the main visitor groups at SFERA, specifically students, staff, and visitors, enabling valuable insights into environmental awareness, willingness, and conservation perceptions based on this site under investigation.

3.4 Instruments

The questionnaire for this study was adapted from previously validated constructs [11-13] in wildlife tourism and pangolin conservation studies. The usage of the questionnaire items was derived from prior studies of ecotourism, environmental awareness, conservation behaviour and wildlife-related visitors' responses but was altered and contextually adjusted accordingly. There were several items (which were generally not adopted directly), which were reworded to adapt for the SFERA UMS context (including admiration of pangolins in the adoption for pangolin conservation). The final instrument comprised separate item sets for visitor awareness, visitor willingness, visitor preferences, and support for pangolin conservation.

A pilot test was carried out to test the clarity, reliability, and content validity of each item before the deployment of the survey. The data were gathered using a structured questionnaire of four sections. Section A captured respondents' demographic profile. Section B covered the visitor awareness item, measuring respondent knowledge and understanding of pangolin conservation and other related wildlife issues. Section C measured the visitors' willingness using items that represented commitment to participate in or support conservation efforts. Section D measured visitor preferences using items evaluating respondent preferences toward conservation-based ecotourism experiences. Furthermore, some questionnaire items centered on support for pangolin conservation. In order to assess all behavioral items (awareness, willingness, and preferences), it performs the application of a 5-item Likert scale to conduct (1 = strongly disagree, 5 = strongly agree).

Visitor awareness items measured respondents' knowledge and understanding of pangolin conservation, wildlife protection, and the ecological importance of conservation in an ecotourism context. Visitor willingness items assessed respondents' readiness to take part in, support, or engage in conservation-related actions or initiatives. Visitor preferences items captured respondents' inclination toward conservation-oriented ecotourism experiences, such as guided learning, interpretation, and educational activities. The dependent variable, support for pangolin conservation, was assessed with items that reflect respondents' current support for the protection and conservation of the Sunda pangolin. All items were rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The final questionnaire included 5 items each for visitor awareness,

visitor willingness, visitor preferences, and support for pangolin conservation. A summary of the questionnaire items and their construct allocation is provided in Appendix A to enhance measurement transparency and replicability.

The dependent variable for this study was support for pangolin conservation. This is expressed as respondents' support for conservation efforts on the Sunda pangolin. It was measured with survey items as capturing pro-conservation support in the ecotourism context. For the sake of consistency, the construct was referred throughout the paper as support for pangolin conservation.

In this study, visitor preferences refer to respondents' inclination toward conservation-oriented ecotourism experiences, such as guided forest walks, wildlife interpretation, and educational activities that expose visitors to biodiversity and conservation messages. Thus, this construct may not only reflect their general leisure preference but rather is based on the extent to which they tend to like or prefer ecotourism activities with educational and conservation-oriented content. The measurement indicators for visitor preferences were designed to assess respondents' level of attraction to these forms of ecotourism engagement within the SFERA UMS setting.

Specifically, the indicators capture respondents' preference for participating in ecotourism activities that involve direct learning, interpretation, and guided exposure to conservation-related themes, rather than preference for tourism activities in a purely recreational sense.

3.5 Data collection

Data collection was conducted for a specified period at the SFERA main entrance, the interpretation area, and popular ecotourism trails. Data collection was carried out over a period of approximately 4 months from September 2025 to December 2025. The survey was conducted on site at SFERA UMS during this period. Participants were informed about the purpose of the research, assured about anonymity and confidentiality, and participated voluntarily. The questionnaire required 8–12 minutes to complete. Participants were approached at locations within SFERA that were part of visitor entry, interpretive activity, and ecotourism. Their responses were obtained in the context of site-based ecotourism, where biodiversity and conservation themes were provided as part of the experience for the visitors. In addition, the questionnaire further framed pangolin conservation as a conservation issue, thus inviting participants to share their awareness, willingness, preferences, and support regarding the conservation issue.

3.6 Data analysis

Reliability of the constructs was evaluated by Cronbach's alpha. All coefficient values surpassed the acceptable limit of 0.70 established by Nunnally [17], indicating acceptable internal consistency of the scales. Content validation of the items was established through an expert review performed by academic supervisors with an understanding of ecotourism and conservation studies. The study employs descriptive analysis to determine the distribution of respondents and their attributes while also examining the reliability of the scale. Data was also analyzed using correlation and regression analysis.

4. RESULTS

4.1 Demographic profile of respondents

The demography part presents background features of the respondents in this research. The motivation behind this section is to provide as integral a picture of their profile as possible, which helps to understand the sample. The information provided regarding their demographics includes age, gender, occupation type, level of education, and respondent category at University Malaysia Sabah.

Table 1. Demographic profile of respondents

Demography	Category	Frequency	Percentage
Gender	Male	170	45.1
	Female	207	54.9
Age	Under 18 years old	2	0.5
	18-25 years old	262	69.5
	25-40 years old	86	22.8
	Above 40 years old	27	7.2
Occupation	Student	242	64.2
	Government Staff	86	22.8
	Private Sector	25	6.6
	Self - Employed	13	3.4
	Other	11	2.9
Education Level	Primary	0	0
	Secondary	24	6.4
	Diploma	53	14.1
	Bachelor's Degree	271	71.9
Visitors	Postgraduate	29	7.7
	Student	227	60.2
	Staff	75	19.9
	Tourist or Visitors	75	19.9

Table 1 presents the demographic results of the respondents. Gender shows that 170 male respondents were recorded (45.1%), while 207 female respondents were recorded (54.9%). Regarding the average age of each respondent, 2 respondents under 18 represent 0.5%. Meanwhile, respondents aged 18-25 years old had the highest number at 262 out of 377 respondents, or 69.5%. Then, respondents aged 25-40 years numbered 86 (22.8%), and the remaining were respondents aged 40 years and above, totaling 27 (7.2%).

Then, the employment type for each respondent shows that students had the highest number, 242 people, which is 64.2%. The second-highest would be government employees, with 86 respondents (22.8%). The private sector is next, with 25 respondents (6.6%). The self-employed are next with 13 respondents (3.4%), and finally, others had 11 respondents (2.9%).

Regarding education level, the table shows that no respondents had a low basic education level. In secondary education, the total number counted was 24 people, representing 6.4%. The diploma level of education accounted for 53 respondents (14.1%). On the other hand, master's degree education was the most common among respondents, with 271 people (71.9%). Lastly, postgraduate education was reported by 29 respondents (7.7%).

Lastly, the "student" category recorded 227 respondents, equivalent to 60.2% of the total 377 respondents. As for the "staff" and "visitors or tourists" categories, both recorded 75 people, for a combined 19.9%. A total of 377 respondents participated in the survey. The demographic composition reflects the visitors' profile at SFERA UMS. 59% of respondents were students, 24% were UMS staff, and 17% were tourists. 55% were female, while 45% were male. Most of the respondents (35%) were aged between eighteen and thirty-five years, which is the primary visitor's profile at SFERA. Moreover, the demographic distribution showed enough diversity to evaluate visitors' attitudes, perceptions, and preferences towards pangolin conservation.

4.2 Descriptive analysis

The descriptive statistics of the main variables of the study are shown in Table 2.

Table 2. Descriptive analysis (N = 377)

Variable	Mean	Std. Deviation
Support for Pangolin Conservation	4.4887	0.61376
Visitor Awareness	4.3841	0.67726
Visitor Willingness	4.3655	0.63696
Visitor Preferences	4.2058	0.61339

Table 2 indicates mean values that were relatively high among study variables. Support for pangolin conservation had the highest mean (M = 4.4887, SD = 0.61376), showing that respondents were supportive of pangolin conservation. Visitor awareness also had a high mean (M = 4.3841, SD = 0.67726), indicating that respondents were aware of pangolin conservation and related issues. Visitor willingness was high (M = 4.3655, SD = 0.63696), meaning respondents were willing to engage in or support conservation-related activities. Visitor preferences recorded a slightly lower but still positive mean score (M = 4.2058, SD = 0.61339), reflecting respondents' favourable orientation toward conservation-oriented ecotourism experiences. Overall, the relatively low standard deviations indicate fairly consistent responses among the 377 respondents. Thus, the results show that respondents consistently had a positive view of all variables, with mean scores above 4.20 and standard deviations below 0.70, indicating strong agreement.

4.3 Reliability testing

Reliability analyses indicated that all the constructs have acceptable internal consistency (Cronbach's $\alpha > 0.70$).

Table 3. Reliability test

Construct	Cronbach's Alpha (α)
Support for Pangolin Conservation	0.836
Visitor Awareness	0.867
Visitor Willingness	0.876
Visitor Preferences	0.775

Table 3 indicates that all constructs exceeded the past reliability standard of 0.70, confirming internal consistency and suitability for inferential analysis. Reliability analysis in Table 3 was performed to measure the internal consistency of

the study constructs utilizing Cronbach's Alpha (α). All four of the constructs exhibited satisfactory to excellent reliability, surpassing Nunnally and Bernstein's (1994) minimum acceptable standard of 0.70. Support for pangolin conservation's Cronbach's Alpha was 0.836, suggesting strong internal consistency amongst the items. Visitor Awareness ($\alpha = 0.867$) and Visitor Willingness ($\alpha = 0.876$) were also found to be highly reliable, indicating that the items under these constructs behaved consistently and accurately measured the respective constructs. Visitor Preferences ($\alpha = 0.775$) showed acceptable reliability, indicating the items were adequately correlated and stable for further analysis. In general, the findings confirm that all the constructs used in the current study were reliable and suitable for subsequent statistical analyses, including correlation and regression analysis.

4.4 Correlation

A correlation analysis was conducted to assess the relationships among awareness, willingness, preferences, and support for pangolin conservation.

Table 4. Result of correlation analysis

Variables	Support for Pangolin Conservation Coefficient	Sig.
Visitor Awareness	0.783**	< 0.01
Visitor Willingness	0.753**	< 0.01
Visitor Preferences	0.666**	< 0.01

Note: ** Correlation is significant at the 0.01 level (2-tailed)

The correlation analysis (Table 4) reveals that support for pangolins' conservation is positively related to all three predictor variables. The highest relation between awareness of pangolin conservation and support is shown in $r = 0.783$, visitor willingness is ranked second with $r = 0.753$, and the least was visitor preferences with $r = 0.666$. All correlations are statistically significant and positive at 0.01.

It indicates that the dependent variable is associated with stronger as awareness, willingness, and preference increase. Out of the three independent variables, awareness had the strongest relation to the dependent variable. The second was visitor willingness is in second place, whereas visitor preferences ranked the least.

4.5 Hypothesis testing

Multiple regression analysis was performed to assess the predictive capacity of awareness, willingness, and preferences on support for pangolin conservation.

Table 5 shows the multiple regression results examining how the three variables: visitor awareness, visitor willingness, and visitor preferences contribute to visitors' support for pangolin conservation. The model has good explanatory power ($R = 0.849$, $R^2 = 0.721$, Adjusted $R^2 = 0.719$), which means that the independent variables account for 72.1% of the variation in support for pangolin conservation. The F-statistic also shows the model was statistically significant and robust ($F = 321.470$, $p < 0.001$), indicating the set of predictors provides a significant joint contribution to explaining support for pangolin conservation. Among the variables, visitor awareness was the most influential factor contributing to support for pangolin conservation ($\beta = 0.529$, $t = 11.229$, $p < 0.001$), suggesting that higher levels of awareness are

associated with support for pangolin conservation. Visitor willingness also showed a significant positive ($\beta = 0.315$, $t = 5.976$, $p < 0.001$), suggesting that visitors who are more willing to participate or engage in conservation-related activities tend to report stronger support for pangolin conservation. In contrast, visitor preferences did not significantly predict support for pangolin conservation ($\beta = 0.059$, $t = 1.355$, $p = 0.176$), suggesting that preferences alone do not meaningfully explain conservation support in this model.

Table 5. Hypothesis testing

Variables	Beta	SE β	β	T-Value	Sig.
Constant	0.818	0.125		6.54	0.001
Visitor Awareness	0.479	0.043	0.529	11.229	0.001
Visitor Willingness	0.303	0.051	0.315	5.976	0.001
Visitor Preferences	0.059	0.043	0.059	1.355	0.176
R	0.849			R Square Change	0.721
R Square	0.721			F Change	321.47
Adjusted R-Square	0.719			Sig. F Change	3
Std Error of the Estimate	0.325				

Note: SE = Standard Error

Visitor willingness also showed a significant association with support for pangolin conservation ($\beta = 0.315$, $t = 5.976$, $p < 0.001$), suggesting that visitors who are more willing to participate or engage in related activities tend to report stronger support for pangolin conservation. In contrast, visitor preferences did not significantly predict support for pangolin conservation ($\beta = 0.059$, $t = 1.355$, $p = 0.176$), suggesting that preferences alone do not meaningfully contribute to support for pangolin conservation. It means that, despite their preferences for certain activities or aspects of ecotourism, individuals are not willing to engage in conservation-oriented behavior unless they are aware of or willing to do so. In summary, the results indicate that participation in ecotourism-related experiences at SFERA UMS is associated with stronger support for pangolin conservation.

5. DISCUSSION

This study affirms and suggests that ecotourism involvement in SFERA UMS is associated on supporting conservation of the Sunda pangolin. The findings should be interpreted in light of the respondent profile. A large proportion of the sample consisted of UMS students and staff, whereas a smaller proportion represented tourists or non-university visitors. This composition suggests that the study primarily reflects the perceptions of individuals already embedded in an academic, environmentally informed setting. As such, the reported levels of awareness, willingness, and conservation support may be relatively stronger than those expected among broader ecotourism audiences. Accordingly, the present findings are most appropriately understood within the context of a university-based ecotourism site.

The results indicate that awareness and willingness, two characteristics gained from ecotourism experience, are major predictors of conservation support. These findings suggest that,

in the context of ecotourism, visitor awareness is positively associated with support for pangolin conservation. Respondents with higher awareness tended to report stronger conservation support. As determined by the regression analysis, visitor awareness emerges as the most powerful predictor of conservation's support. It indicates that, with awareness on pangolins' ecological function, poaching menace, and conservation status, visitors' willingness to support conservation both increases. The strength of awareness is a clear indicator of the predictive capability of awareness attests to the TPB's prediction that awareness is an antecedent of behavioral intentions. In ecotourism conception, awareness may be heightened by interpretative literature, guided tours, and educational exhibitions, which eventually strengthens conservation's motivational role. Visitors who are made cognizant of their destination's environmental and cultural importance during their visit may tend to be inclined towards advocating for its conservation [18].

The visitor's willingness also showed a significant and positive association. It suggests that ecotourism not only cultivates the education of visitors but also drives them to engage in supporting behaviours like participating in volunteerism, exhibiting conservation-respectful behaviours and advocating for pangolin conservation. Environmental awareness enhances visitors' comprehension of conservation's significance in conservation whilst breeders' willingness is the inherent to implement this knowledge [19]. Although visitation preferences were considered, predictors analysis exhibited that preferences and beneficial support behaviours were not related. It implies that predisposition towards a specific activity and experience does not necessarily influence conservation behaviour. The non-relevant visitation preferences imply that favouring ecotourism activities does not correspond to conservation support for pangolins. In this case, preferences might connote experiential interests or choice of activity instead of a strong commitment to conservation. It might explain while visitation preferences influenced the outcomes by a lower factor than awareness and willingness in predicting conservation support. It indicates that a preference for visiting ecotourism activities might not be adequate without stronger awareness and motivation to be an advocate for conservation.

The educational aspects are crucial in enhancing visitors' awareness of the natural environment and conservation challenges. Raising visitor awareness about local ecosystems will foster a sense of commitment and inspire them to engage in conservation behaviours at the core of ecotourism practices [20]. Thus, conservation messaging and formal education aspects are still essential even in enticing ecotourism destinations. The results correlate closely to several United Nations Sustainable Development Goals. Concerning SDG 15 (life on land), visitor awareness and willingness had a strong influence, confirming the significance of ecotourism in enhancing public awareness of biodiversity conservation and endangered species conservation. The arm opened the SDG 4 quality education aspect through implementing the ecotourism at SFERA UMS to ensure practical education for raising awareness and environmental knowledge. Besides, willingness was also positively associated with conservation-supportive behaviours, which aligns with SDG 12 on responsible consumption and production. These results indicate the role of ecotourism in achieving integrated sustainable conservation outcomes.

6. CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Within the context of SFERA UMS, ecotourism appears to be an important medium for improving the support for conservation. Awareness and willingness were two predictor variables that were positively related to action in support of conservation. This shows that ecotourism can have a double-edged effect in education and conservation. On the other hand, preference was not significantly related to support for conservation, indicating that preference in enjoyment cannot translate into support for conservation unless there is education. This study concludes that ecotourism that offers structured education and voluntary action will have good potentials in conservation activities. This study concludes that ecotourism at SFERA UMS plays an important role in improving the public's willingness to support Sunda pangolin conservation. It confirms, using regression analysis, that the awareness of the visitor is the most significant predictor of support for conservation, followed by the willingness of the visitor.

However, visitor preferences do not significantly contribute to conservation support. Such findings reinforce the need for educational content, interpretive material, and interactive conservation activities to convert the ecotourism experience into pangolin conservation. Ecotourism at SFERA UMS has considerable potential to increase pro-environmental awareness and behavioral intentions that meet SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production), and SDG 15 (Life on Land). This study contributes to one of the earliest empirical studies in Malaysia linking ecotourism with conservation support for the Sunda pangolin (*Manis javanica*), supplemented with behavioral variables (awareness, willingness, and preferences). This study shows that awareness and willingness are the two variables most strongly associated with support for pangolin conservation in the present sample, in the context of protecting the Sunda pangolin, and provides an empirically validated model for understanding visitor behavior in wildlife-related ecotourism. The findings of this study may inform the development of potential conservation interventions and future academic research agendas.

6.2 Implications

Given that visitor awareness remains the most significant predictor of conservation support, it is essential to enhance the educational and interpretive components of ecotourism programs, including guided tours and educational media. Second, given that visitor willingness is another key predictor of support for conservation, ecotourism operators can improve behavioral engagement through participatory experiences such as workshops, volunteerism, and conservation projects to strengthen participation in ecotourism programs. Third, while visitor preferences do not predict conservation support, they may still play a role in support for pangolin conservation. Thus, conservation-related messages should be integrated into experience-based activities that, therefore, account for visitor preferences. Finally, collaborating with local agencies, such as the Sabah Wildlife Department and NGOs, as well as UMS research units, may help expand outreach to visitors, thereby sustaining engagement in conservation activities.

Indeed, to improve ecotourism efforts to promote Sunda pangolin conservation in SFERA UMS. Given that visitor awareness is the most significant predictor, the educational and interpretive aspects of ecotourism activities should be prioritized. It can be achieved by ensuring the quality and visibility of promotional materials, such as interpretive panels, guided walk scripts, digital exhibits, and pangolin-related learning tools. In addition, it would be beneficial to increase the number of hands-on, participatory conservation efforts to strengthen visitors' willingness, which is another significant predictor of conservation support. Volunteer work, citizen science initiatives, nature hikes, exhibitions, and workshops can facilitate emotional involvement and encourage behavioral intents. Aside from visitor preferences being found not significant predictors, preference activities can be an alternative approach to increase engagement through the application of discreet conservation messages in creative and leisure activities. Meanwhile, strategic partnership collaboration with relevant authorities, including the Sabah Wildlife Department, local Non-Governmental Organizations (NGOs), and UMS research institutions, is key to broadening conservation awareness, enhancing resource sharing and possibilities to improve the implementation of educational activities. Finally, improved communication and reporting means, including interactive ecological signage, QR information platforms, and online reporting platforms, can enhance public appreciation, facilitate real-time learning, and ensure conservation engagement beyond the ecotourism site.

6.3 Limitations and future research

The current limitations discussed are convenience sampling, which may limit the generalizability beyond SFERA UMS visitors, and self-report data, which may suffer from social desirability bias. Another important limitation relates to the characteristics of the sample, with a predominance of UMS students and staff, and a lesser number of general tourists and external visitors. This finding may introduce an institutional or education-related bias since the university-based respondents are likely to be familiar with environmental values and conservation. The conclusions made in this study should therefore not be broadly applied to all ecotourism visitors, but instead interpreted only within the context of a university-based ecotourism venue like SFERA UMS.

Additionally, the cross-sectional design of the study does not enable causal inference. The timing of the data collection may have influenced the respondent profile, especially the proportion of students, since the composition of the visitor numbers of SFERA UMS may differ between academic and non-academic periods. Future studies may consider utilizing longitudinal approaches, multi-site comparisons, or mixed methods to broaden understanding of behavioral motivations. In particular, future studies should include a larger proportion of general tourist and non-university visitor samples to increase the representativeness of the sample. Collecting data from multiple ecotourism sites would allow comparison of the attitudes at university-based versus non-university-based ecotourism destinations to boost the external validity of the findings. Additionally, qualitative interviews may provide a more in-depth understanding of the visitors' views and behavioral drivers.

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